Thermodynamic principles are central to understanding material behaviour, particularly as the application of these concepts underpin phase equilibrium, transformation and state. Whilst this is a complex and challenging area, the use of computational tools has allowed the materials scientist to model and analyse increasingly convoluted systems more readily. In order to use and interpret such models and computed results accurately, a strong understanding of the basic thermodynamics is required.

This fully revised and updated edition covers the fundamentals of thermodynamics, with a view to the modern computer applications. The theoretical basis of chemical equilibria and chemical changes is covered with an emphasis on the properties of phase diagrams. Starting with the basic principles, discussion moves to systems involving multiple phases. New chapters cover irreversible thermodynamics, extremum principles and the thermodynamics of surfaces and interfaces. Theoretical descriptions of equilibrium conditions, the state of systems at equilibrium and the changes as equilibrium is reached, are all demonstrated graphically. With illustrative examples – many computer calculated – and exercises with solutions, this textbook is a valuable resource for advanced undergraduate and graduate students in materials science and engineering.

Additional information on this title, including further exercises and solutions, is available at www.cambridge.org/9780521853514. The commercial thermodynamic package 'Thermo-Calc' is used throughout the book for computer applications; a link to a limited free of charge version can be found at the above website and can be used to solve the further exercises. In principle, however, a similar thermodynamic package can be used.

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